

# **HEMISPHERICAL, HIGH BANDWIDTH MECHANICAL INTERFACE FOR COMPUTER SYSTEMS**

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## **ABSTRACT OF THE DISCLOSURE**

10 A mechanical interface for providing high bandwidth and low noise mechanical input and output for computer systems. A gimbal mechanism includes multiple members that are pivotably coupled to each other to provide two revolute degrees of freedom to a user manipulatable about a pivot point located remotely from the members at about an intersection of the axes of rotation of the members. A linear axis member, coupled to the user object, is coupled to at least one of the members, extends through the remote pivot point and is movable in the two rotary degrees of freedom and a third linear degree of freedom. Transducers associated with the provided degrees of  
15 freedom include sensors and actuators and provide an electromechanical interface between the object and a computer. Capstan band drive mechanisms transmit forces between the transducers and the object and include a capstan and flat bands, where the flat bands transmit motion and force between the capstan and interface members. Applications include simulations of medical procedures, e.g. epidural anesthesia, where the user object is a needle or other medical instrument,  
20 or other types of simulations or games.